California Energy Commission

Staff Workshop
May 25, 2011

Energy Commission Staff Approach to Estimating Historical Efficiency Program Impacts

Chris Kavalec

Demand Analysis Office

Electricity Supply Analysis Division

Chris.Kavalec@energy.state.ca.us

916-654-5184

Summary of Presentation

- Describe general approach to estimating historical efficiency program impacts reported in IEPR forecasts

- Focus on 1976-1997 period

- Staff recommendations

- Preliminary "consumption metric" analysis of historical program impacts

Types of Savings Included in IEPR Forecasts

- ## Codes and Standards
  - Introduced into models through changes in average consumption at end use level

- ## Naturally Occurring Savings
  - Mainly price effects, handled through model price elasticities

- ## Efficiency Programs
  - Introduced into models directly or post-processed (subtracted from model results)

Efficiency Program Treatment by Period
This presentation focusing on 1976-1997

Historical and Committed IOU Energy Efficiency Program Impacts - Data Sources and Assumptions for the 2009 IEPR Forecast

		1976-1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013-2020
A	Program Year	1976-1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013-2020
B	Program Accomplishments (starting point)	Utility Annual Reports and Expectations	IOU Annual Utility Reports of Net Savings					Quarterly / Monthly Utility Reports of both net and gross savings - Compiled by Itron					Quarterly Utility Reports of both net and gross savings - Compiled by CEC	Monthly Utility Reports - CEC staff projected total accomplishments by examining 2009 progress through June relative to 2008	Gross savings projections by end use category from March 2009 Filings			Estimated "market potential" in ASSET. Two scenarios: "base" and "full" that differed by assumed level of incentives.
C	Level of Disaggregation	Program	Sector					End Use Category					Measure	End Use Category				Measure
D	End Use Attributions	For programs quantified in the models it varys by program mostly HVAC savings	CEC staff applied 2003 ratios to sector savings totals					Measure data was consolidated into end-use categories by Itron					Measure data was consolidated into end-use categories by CEC staff	CEC staff applied 2008 ratios to projected sector savings totals	Provided by the utilities			Measure data was consolidated into end-use categories by Itron staff
E	NTG Ratios	Varies by Program (annotated by program when possible in accompanying sheets)	Assumed 80%					Determined by comparing net reported savings to gross reported savings at the end-use level					Measure-level NTG ratios were taken from the quarterly report workbooks	Assumed 80%				From ASSET: model predicts free ridership at the measure level
F	Realization Rates	None applied, some programs reduced to account for overlap	A 70% realization rate is applied to net first-year savings, resulting in "net realized" first-year savings. Derived from CPUC Energy Division *2006-2007 Verification Report* (November, 2008). Study recommended downward adjustments to net savings of around 30 to 40 percent depending on utility.															None applied
G	EULs	Varies by Program (annotated by program when possible in accompanying sheets)	Average EULs are determined for each end use category based on 2006 - 2008 program workbook data															DEER, by measure
H	Other Adjustments	See accompanying sheets "res savings," "com savings," and "non res-com savings"	Excluded industrial savings, excluded agricultural savings not incremental to base year, excluded commercial lighting, residential refrigerator recycling, residential pool pumps (reduces 1st year net realized savings by 24-32%)															Accounted for overlap between programs and other efficiency initiatives
I	Total adjustment to gross savings (%)	See accompanying sheet "summary"	Total adjustment (remaining) 1st year gross savings = approximately 0.80*0.7*(1-.24)=43% in 2008, 0.80*0.70*(1-.32)=38% in 2012															Varies by scenario
J	Decay Methods	Same as post 98 but at a program level	100% of "net realized" first-year impacts are counted in the installation year. Those impacts decay to 50% by the end of of useful life (which is specific to each end use category). The effects decay quickly to zero after the useful life.															Very little decay. Asset generally predicts equivalent replacement of efficiency measures

Staff Calculation of Accumulated *Ex Ante* Claimed Program Savings vs. Program Savings Reported in 2009 IEPR
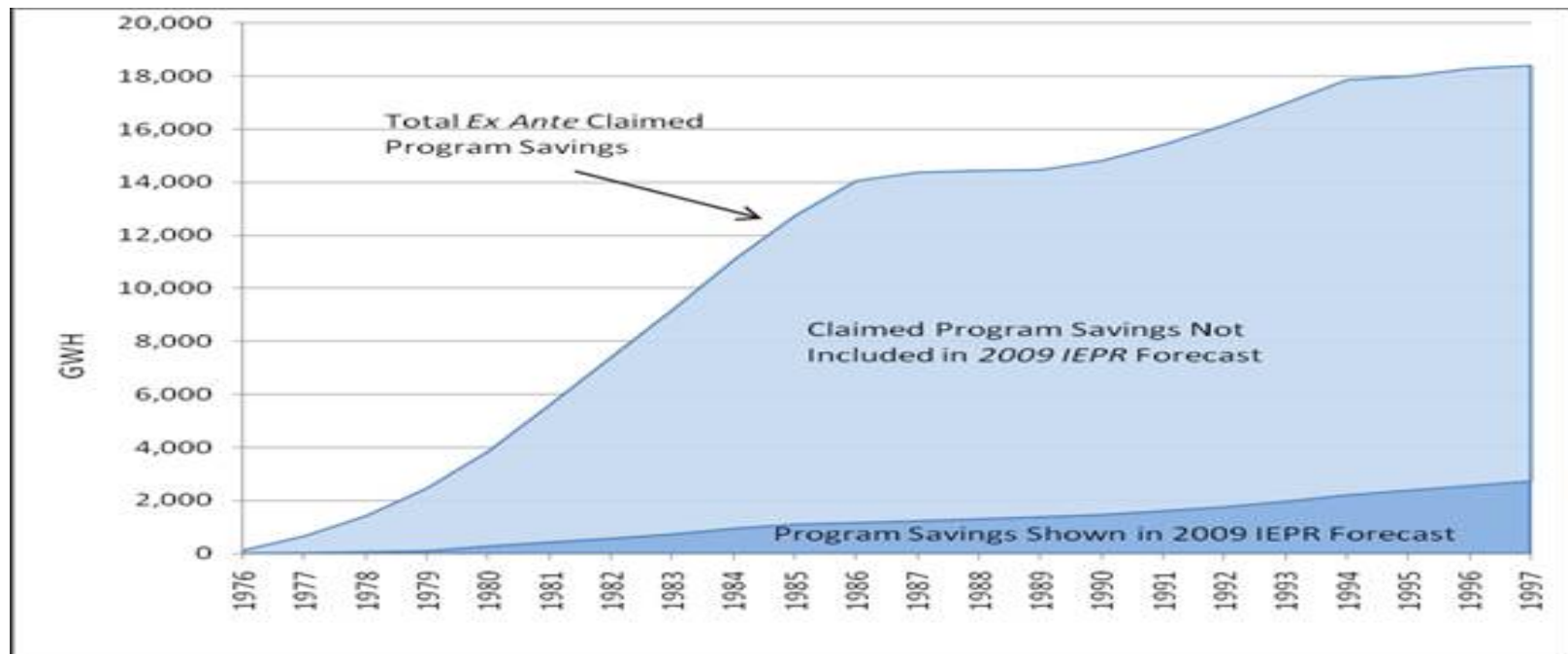
Why the Big Difference?

1. Program savings for sectors other than residential and commercial not reported in *2009 IEPR* except as incremental to savings in last historical year

    –   Historical program savings in residential and commercial (end use models) must be specified explicitly as part of the forecasting process

    –   Historical program savings in other sectors (econometric, trend models) embedded in historic consumption data

# Efficiency Program Impacts as Addressed in Energy Commission Models

Characteristics	Sector				
	Residential	Commercial	Industrial	Agriculture/ Water Pumping	Transportation/ Communications/ Utilities and Street Lighting
Type of Model	End Use Analysis: "Bottom Up"	End Use Analysis: "Bottom Up"	Econometric, Aggregate Level: "Top Down"	Econometric, Aggregate Level: "Top Down"	Trend Analysis, Aggregate: "Top Down"
Program Impacts Specified	Historical and Forecast	Historical and Forecast	Forecast (Impacts Above Base Year)	Forecast (Impacts Above Base Year)	Forecast (Impacts Above Base Year)
Reported with Forecast	Historical and Forecast	Historical and Forecast	Forecast (Impacts Above Base Year)	Forecast (Impacts Above Base Year)	Forecast (Impacts Above Base Year)
Level of Efficiency Specification	End Use	End Use	Aggregate Totals	Aggregate Totals	Aggregate Totals

# Relative Size of Claimed Program Savings in Non-Residential, Non-Commercial Sectors
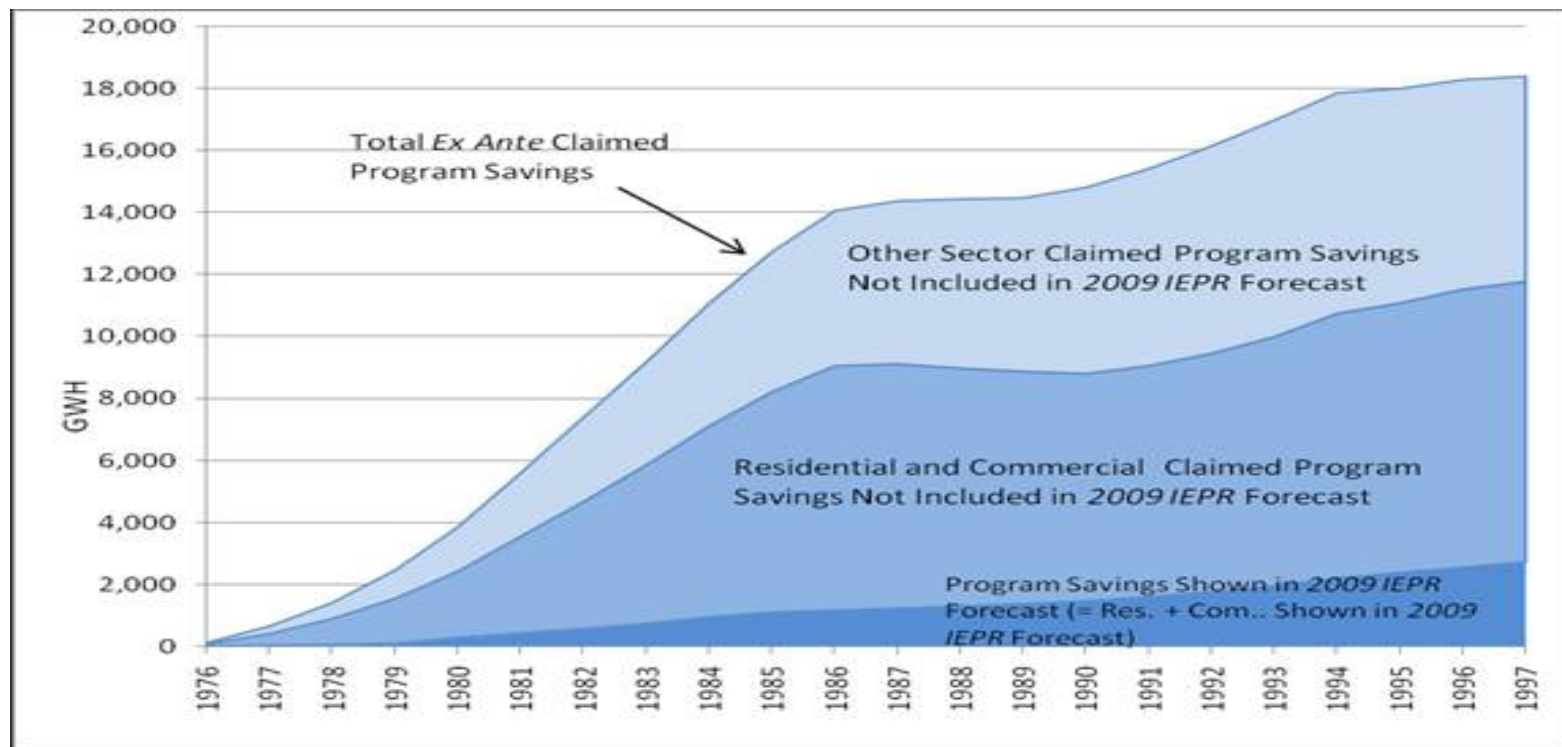
Why the Big Difference?

2. Residential and commercial information, education, and residential appliance rebate programs excluded

- Information and education programs, in particular, have little verified, long-term savings associated

- Residential appliance typically folded into the standards ramping up process within the models when simulating the effects of new appliance standards

Relative Size of Excluded Residential and Commercial Program Savings
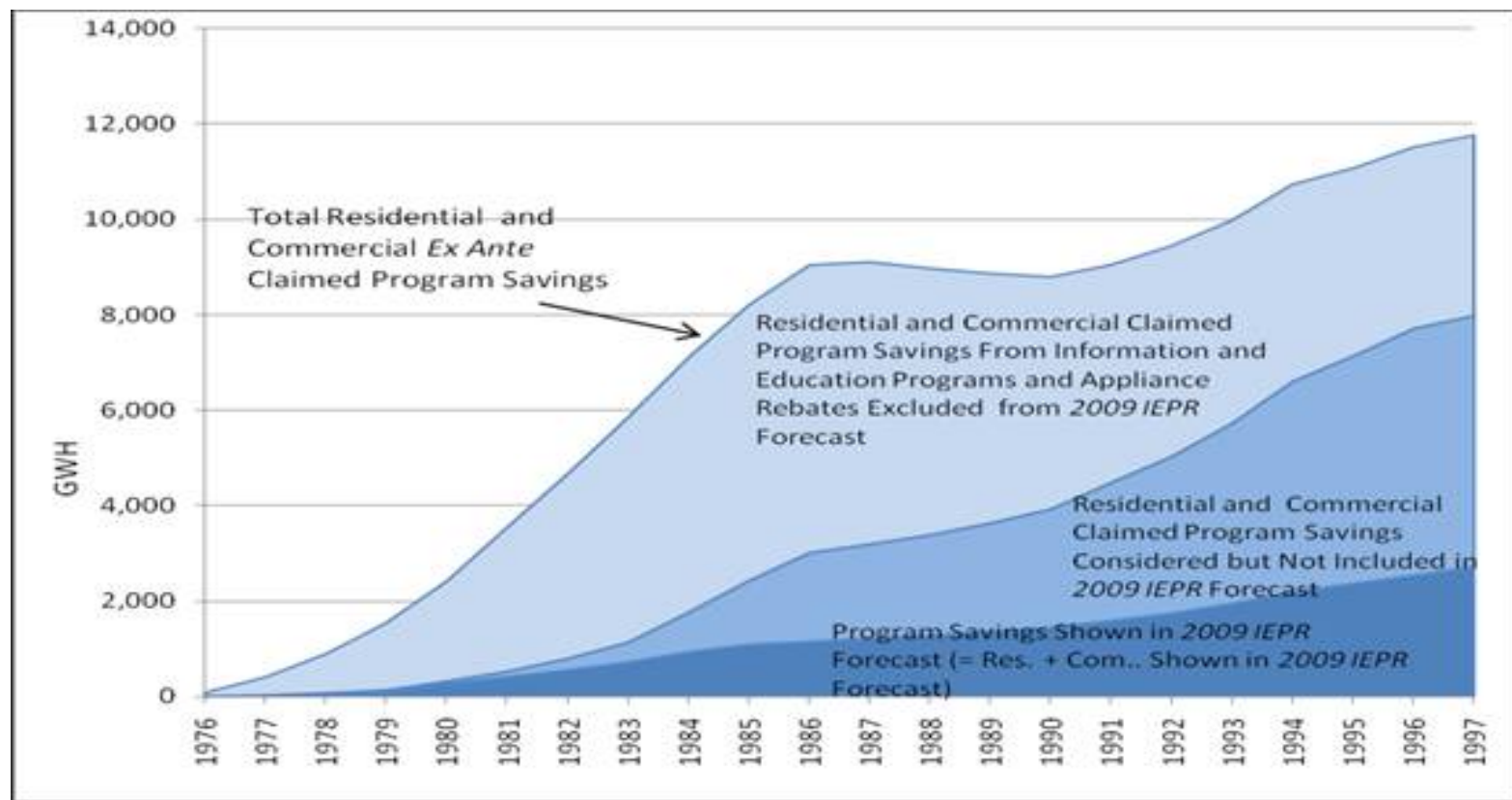
Why the Big Difference?

3. Final residential and commercial program savings included in forecast out of the total considered (33-50 percent for 1976-1997) is a result of staff judgment at the time

   – "Reality check"

   – Need to develop realistic backcast

Attribution Issue

- Overlap of standards and program savings
  - Example: appliance rebates
  - Uncertainty in standards impacts (compliance, etc.)

- Overlap of naturally occurring (price effects) and program savings
  - Availability of incentives for and information on efficiency measures would tend to increase price response in the face of a rate increase

Program Savings vs. Naturally Occurring, *2009 IEPR*
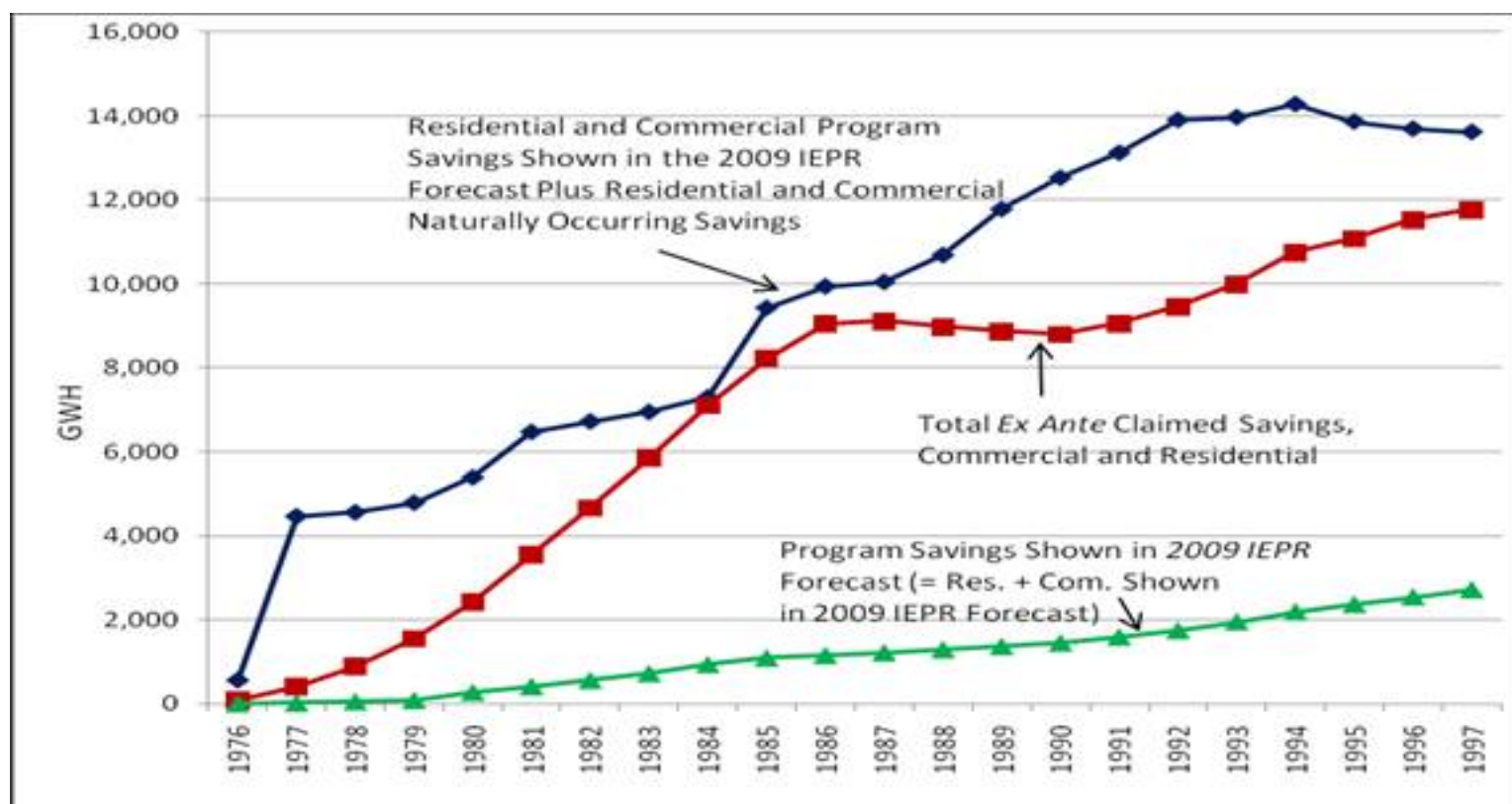
Impact on Forecast of 1976-1997 Program Savings Estimates

- Impact through calibration of residential and commercial models

  – If historical program savings underestimated, forecast is biased downward (calibration, or scaling, factor is lower compared to calibration with "true" savings)

  – Impact should be minimal given passage of time

Staff Recommendations

1. No staff time or resources should be used in re-estimating historic residential and commercial efficiency program load impacts

   – There is no reason to believe that re-analysis will yield different results given the lack of adequate ex post studies and data

   – In the future, the results of the joint Energy Commission-CPUC consumption metric work may provide a basis for changing current estimates

Staff Recommendations

2. Staff has focused on residential and commercial program impacts. In future forecasting reports, staff should include an estimate of other sector program impacts wherever program savings are shown

    –   In addition, staff should include estimates of naturally occurring savings for these sectors

Staff Recommendations

3. Because of possible significant overlap among different sources of savings, staff should first show total savings (the sum of the three sources) without individual attribution whenever reporting savings

    –   Staff should then present estimates of savings by type with full qualification of these estimates and discussion of overlap and other uncertainties

Staff Recommendations

4. With respect to efficiency, staff's focus should be on analysis of more recent and future impacts

   – The Energy Commission and CPUC should strive to make data available for this purpose, allowing staff to provide more comprehensive analysis, including incorporation of "rebound," "takeback", and other indirect effects from efficiency initiatives

Staff Recommendations

5. Staff should work with stakeholders through the DAWG to ensure that efficiency impacts are presented in the most useful (and user-friendly) manner possible

Consumption Metric for Efficiency Programs

- "Teasing out" savings from consumption data

- Energy Commission staff have done some preliminary work

- Preliminary work shows program savings significantly lower than *ex ante* claimed

Econometric Estimation 1: DSM Expenditures
By Planning Area (Big 5), Annual Data 1990-2008

Variable	Estimated Coefficient	t-statistic
Per Capita Income	0.4713	4.83
Electricity Rate in Cents/KWh	-0.0900	-1.61
Natural Gas Rate in Cents/Therm	0.1181	2.82
Number of Cooling Degree Days	0.1838	5.96
Number of Heating Degree Days	0.2044	8.88
Dummy: 2001	-0.0465	-1.66
DSM Expenditure Per Capita	-0.0011	-2.11
Time Trend	-0.0134	-5.78
Constant	0.9978	0.95

Dependent Variable = Per Capita Electricity Consumption
All Variables in logged form except DSM expenditure and time trend; R Squared = 0.86

Econometric Estimation 2: *Ex Ante* Claimed Savings
By Planning Area (Big 5), Annual Data 1980-1997

Variable	Estimated Coefficient	t-statistic
Electricity Rate in Cents/kWh	-0.0373	-2.23
Per-Capita Income	0.4360	4.00
Commercial Floor Space	0.5440	5.92
Cooling Degree Days	0.0482	6.18
Heating Degree Days	0.0147	1.44
Constant: LADWP	-0.2633	-14.13
Constant: PG&E	0.0294	1.68
Constant: SCE	-0.0445	-2.88
Constant: SDG&E	-0.2491	-11.18
Claimed Savings Per Capita	-0.000043	-2.05
Time Trend	-0.0071	-3.88
Unemployment Rate	-0.0054	-2.70
Overall Constant	1.4241	1.15

Dependent Variable = Per-Capita Electricity Consumption; Wald Chi Squared(12)=2,663

All variables in logged form except Claimed Savings Per Capita and Time Trend

Comparison of Econometric Estimates of Program Savings with *Ex Ante* Claimed and 2009 IEPR